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ABSTRACT

This paper critically analyzes the interrelationships among information technology, the curriculum process, student exposure to information technology, and the role of the teacher in developing countries and in the developed world. The paper provides highlights about the tremendous amounts of information readily available in, and accessible through, computer networks around the world (e.g., the Internet). Students' exposure to information technology and computer networks varies, ranging from little or none in developing countries (e.g., Tanzania) to everyday use in most parts of developed countries (e.g., the United States). However, the education industry appears to be globally lagging behind in utilizing information technology to enrich school learning. North American teachers are urged to take the lead as facilitators of structures for synthesizing the information students access and gearing it toward a higher quality of learning. The paper discusses the changed role of North American teachers, and it draws implications for classroom practices and teacher qualities. Finally, it suggests a collaboration between teachers in the developed world and the developing world to reduce the ever-widening gap with regard to information technology. (SM)

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INFORMATION TECHNOLOGY AND THE CURRICULUM PROCESS IN DEVELOPED AND DEVELOPING COUNTRIES: A COMPARATIVE ANALYSIS AND THE CHANGED ROLE OF THE NORTH AMERICAN TEACHER

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Abstract

This paper critically analyses the inter-relationships among Information Technology (IT), the curriculum process, student exposure to IT and the role of the teacher in developing countries as well as in the developed world. It provides highlights about the tremendous amounts of information readily available in, and accessible through, computer networks around the world. Students' exposure to IT and computer networks varies, ranging from little or none in developing countries (e.g. Tanzania) to everyday use in most parts of developed countries (e.g. the United States). However, it seems the education industry is globally lagging behind in utilizing IT to enrich school learning. North American teachers are urged in this paper, to take the lead as facilitators of structures for synthesizing the information students access, and gear it towards higher quality learning. The changed role of North American teachers is discussed, and implications are drawn for classroom practices and teacher qualities. Collaboration is suggested between teachers in the developed countries and the developing world to reduce the ever-widening gap with regard to IT.

1. Introduction

Information Technology (IT) has resulted in tremendous amounts of information accessible through computer networks around the world. The quantity of information is believed to double in increasingly shorter and shorter periods of time. The storage and availability of information on the Internet, in CD ROMs, laser discs and the easy means by which it can be accessed have changed the traditional ways of learning, and cast important questions on the curriculum process. The traditional perception of students as mere participants in a pre-planned curriculum is currently competing with the perception of the same as active, self-motivated learners; explorers of the Internet in search for information of their liking. Access to information exposes them to different ideas and notions, which are related both to their curriculum in different ways, and to their everyday life. It is anticipated that IT will greatly influence major decisions made in the school system and in society in general. Cummins and Sayers (1995) put the message clearly:

> In the world of the 21st century, decision making and problem-solving in virtually all spheres [business, science, community development, government, politics] will depend on electronic networks that span diverse national and cultural boundaries (p 12).

Students in many schools located in large and medium cities like Toronto in Canada, New York, White Plains and others in the United States, have access to the Internet, and are becoming more and more conversant with various information storage and retrieval systems. The almost unlimited exposure to information necessarily interacts with students' experiences in the curriculum process. This interaction and its consequences on students' learning and their ability to evaluate and criticize what they learn is not yet well known to teachers and/or curriculum planners. Classroom teachers as links between the planned curriculum and its actual implementation and evaluation at classroom

level are likely to find themselves in difficult situations where they cannot relate their students' unlimited exposure to information to meaningful learning in the classroom.

On the other hand, there are students in developing countries who are disadvantaged in this area. Students in Dar es Salaam, Tanzania for example, have virtually no access to personal computers, let alone to a network of computers. While the education system in Tanzania is different from the education system in Canada and the United States; and while the contextual goals differ, the ultimate aims of schooling are generally the same. In both contexts they strive to prepare students to take active roles in society; i.e. in the business industry, in social services, in education, etc. Education has to prepare students to acquire knowledge and the sets of skills and values necessary to carry out such roles. It can be argued that the two contexts of schooling and functioning in society are different, but it is also true that exposure to the day to day information running through global networks is always a great advantage, irrespective of context. To the exposed students, the world is becoming smaller and smaller, and global interaction is easier and more necessary than ever before. To the unexposed students the world is becoming bigger and bigger, because they are cut off from the increasing floods of information which exclude their "cacooned" perspectives of the world. Unexposed students will therefore lag far behind in global awareness and technological problem solving skills. As observed by Cummins and Sayers (1995):

> Students whose education has provided them with a broad range of experience in using such networks for intercultural collaboration and critical thinking will be better prepared to thrive in this radically different communications and employment

environment than those who have not been provided with access to cross-cultural awareness and problem solving skills (p. 12).

In the traditional top-down bureaucracy of the school curriculum process, students are generally expected to learn what is designated for them to learn, in the ways prescribed and for the anticipated outcomes as evaluated on the basis of predetermined criteria. Educational decision makers have the power to decide what teachers teach, but certainly not what students eventually learn. It is important to bear in mind that individual learners are unique, although they are often referred to as a group identifiable by age, social economic background, gender, race, ethnic origin etc. Unless the uniqueness of each learner is reached, it is unlikely that meaningful learning of the intended portion of a curriculum will occur. Unlike being taught especially in classroom settings learning is a uniquely individual activity. Students learn things differently irrespective of somewhat "standardized" teaching procedures. Flow of information and its accessibility by learners give learners ample time to search for what they want, for their own reasons. Information Technology and student accessibility to information are not constraints to school learning. They are a means to tap the uniqueness of each student in the learning process and her/his contribution to the learning of the group or class. Information Technology should be taken advantage of by teachers and other education officials who currently have the power to decide what goes into the school curriculum, how it is taught, for what reasons and expectations; as well as how students' authentic learning can be evaluated.

It is time the educational forces in the developed countries started questioning student involvement in the curriculum process in more fundamental ways than ever before, and the necessarily changed role of the teacher. This chapter stresses the need for teachers to be able to take advantage of the students' exposure and experiences by gearing the information towards meaningful, high level learning.

On the other hand, lack of access to computer networks in developing countries is a more serious problem. This problem is likely to result in the largest gap that has ever existed between developed and developing countries. Teacher education programs in developing countries like Tanzania for example, should include IT as a necessary component to make student teachers aware of the information age and the ways it is making the world smaller in terms of communication. For both developed and developing countries, planning of the curriculum process is a crucial starting point in involving teachers and students in using IT as a meaningful part of the school curriculum.

2. Curriculum Planning and Information Technology

Curriculum planning is traditionally a responsibility of school boards, school districts, provinces, nations, states or federal authorities. In some cases curriculum design incorporates planning groups from schools to reduce the top-down rigidity. Even when input from schools is obtained, such input is mostly teachers' input drawn from their own point of view based on experiences in classroom curriculum implementation with various groups of learners. The input may or may not come from students. Evaluation of the curriculum and learning is also done in a top-down fashion where

external evaluation may carry more weight, for example, in accreditation, inspection of schools, or standardized tests.

With the snow-balling of IT and its effect on all aspects of life, it is unrealistic to assume that teachers' experiences with curriculum implementation in the traditional top-down mode are representative of students' learning experiences. The flood of information faced by students necessarily has a bearing on the ways in which they interact with the curriculum process at classroom level. Classroom teachers make effort to gear the implementation of the prescribed curricula towards the local environments on a daily basis. However, the IT part of the exposure has not received due attention from teachers and curriculum planners. It is becoming clearer and clearer that students' learning experiences today can only be *guided* and no longer *entirely provided* by the classroom teacher or curriculum designers.

It is an irony that teachers and students who constitute a formally recognized learning enterprise have not been as enthusiastic and determined as they ought to, in making technology a formal part of their school learning. Fitzpatrick (1994) states a fact brought forward by a Michigan Five Year Technology Plan, that Education is the last major labour intensive industry to begin to use technology in its day to day business; most of the technology that is available to business and government is unknown to students in classrooms. Expressing concern for Michigan State, Fitzpatrick points out that out of Michigan's 524 K-12 school districts only six had a direct connection to the Internet; and of the 57 Intermediate School Districts none had direct Internet

5

connectivity.

In developing countries the situation is even worse; mere communication through electronic mail is still a new phenomenon in universities today, let alone in schools. At the University of Dar es Salaam for example not every faculty has a personal computer and direct access to electronic mail. Often, mail has to be sent through Heads of Departments or individuals who are willing to help others communicate in this way. When graduate students from Tanzania come to study in North American universities they face the centrality of IT and its challenges in both their intended disciplines and mere communication. For example, coming from Tanzania, when I began my doctoral program I had never sat in front of a computer keyboard before. All the same, I had to cope with the situation just like the North American students who had exposure to computer networks. This involved doing credit courses entirely online. There was an additional source of stress. For international students, financial sponsorship was in constant threat of being cut off immediately if the scholar failed a course. The challenges faced by international students, mostly from developing countries are much tenser than those faced by students who have both alternative financial resources and exposure to the necessary technology to keep up with their studies. The needs to catch up with the technological world exist for all students, but the extents of those needs are different, when a comparison is made between graduate students from East Africa for example, and North American graduate students.

Involving IT in curriculum planning needs to start in schools to ease the transition to college and

university. Most IT courses even in Toronto for example, are done as crash programs after school hours or on part time basis. In general, students complete high school and immediately realize their illiteracy in the electronic world and start looking for quick remedial measures. Students in developed countries need preparation at home to meet the challenging situations in North American colleges and universities.

3. Possible Explanation

Teacher education is a well established industry. When technological development started booming in the 1980s teacher education had been in place for about a century. With the traditional curriculum process where school curricula, goals and objectives of learning together with means for achieving them are pre-determined and in some cases rigidly defined, it has been difficult to dynamically reflect and take advantage of IT in the design of teacher preparation programs in order to effect changes in schools.

The speed at which technological changes take place is beyond the rate that can be practically accommodated by the traditional way of planning and implementing the curriculum process. The emergence of affordable multimedia products, online communication, the Internet, the World Wide Web (WWW) etc., has been all too fast to be picked up by the education industry in ways that would be accommodated in school curricula. Given its rate of change and quantities of information, IT in particular calls for a high degree of flexibility in the design, implementation, evaluation and

revision of school curricula.

As discussed by Willis and Mehlinger (1996), within teacher education, computer-mediated learning has erroneously been perceived as a behavioral approach to teaching and learning. Several computerized instruction packages have been developed but they mostly seem to assume that teaching is a systematic process of solving problems. According to Schon (1991), this is the technical rationality model. Utilization of present day IT should look beyond these behavioural models which resulted from the wave of programmed learning in the 1960s and 1970s (Willis and Mehlinger, 1996).

Management of IT has also raised problems, such as who is to manage, maintain and update information; who will create standards (Langenberg, 1991). Other perceived problems are probably to do with screening of information to be accessed by young learners, something which is literally impossible and perhaps undesirable. Educational bureaucrats may express concerns about the future of IT and the Internet with regard to possible negative impact on the functioning of society, including school learning. While such concerns may be justified, they (the concerns) tend to hide the fact that they are based more on ignorance than on interaction with IT itself. Most educational bureaucrats do not invest much of their time on understanding the details of availability, accessibility and organization of information on the Internet. Equity issues have also been raised. Apple (1991) argues that much of the push toward use of computers in the classroom is based on the need for capitalists to generate a work force with specific computer skills. Apple (1991) writes:

> We must prepare teachers who are capable of providing equal opportunities to all students regardless of sex, race, socio-economic status, ability levels, or exceptionalities (p. 17).

Above all problems facing teacher education with regard to IT, funding is probably leading. Willis and Mehlinger (1996) note that teacher education is typically the least funded professional programs in higher education in the United States, and that it is hardly assumed that teacher education requires specialized laboratories, computers and modern telecommunications equipment available to other professional training programs. The authors also note that some public schools are better equipped than the college in which their teachers were trained. In a developing country like Tanzania, it can only be much worse. It is as if teacher education is a profession that can go on with literally close to nothing in terms of funding. This is amazing if we consider that teachers are an important factor in the education of all those who go through the education system, including the bureaucrats who have the power to decide on funding for teacher preparation programs. In Kiswahili we say: "ivushayo mbovu", meaning "after using the means to cross over to safety, that same means is seen as useless". It is difficult to see even one individual in society who has not used teacher education directly or indirectly as a stepping stone to a greener pasture. Yet nobody considers fixing this stepping stone.

Another problem is the interaction between IT and the curriculum process, especially at the

planning stages. With so much advancement in IT what should curriculum planners start with? The mechanics of operating a computer? Electronic mail? Web sites? Multimedia? It is reasonable to argue that keeping top of the line with technological changes and at the same time implementing a curriculum planned a decade earlier is a great challenge to teachers and students as well. However, the starting point has to make sense to teachers and learners. For Tanzanian schools for example, starting with the mechanics of operating a computer will be quite reasonable; while for many North American schools starting with electronic mail or even web sites would be appropriate. Criticising IT rather than making it a part of the curriculum process can only delay the process of catching up. Probably there were similar worries about the invention of the car, the airplane or the telephone, things that nobody can do without today. While teacher education may have had excuses to shy away from IT, there is now a great need to incorporate IT in the entire curriculum process, including teacher preparation.

The Role of Personal Effort

Given the intensity of the education industry, teachers and other educational officials are very busy people. It is likely that they lack the time to invest in exploring the Internet. However, it is still possible for a teacher or other educational official to acquire some literacy in IT, given a little determination and a little effort. My personal experience is that learning a new IT aspect, one at a time, often without pressure, is an effective way to acquire some technological literacy. This is only possible if one has the habit of making use of IT open up and to solve day to day problems. Since new innovations come and go, and since they do so very fast, personal motivation to be

technologically alert and giving room to change in the things we do and how we do them is very important. The emerging motivation among some students is therefore a resource to be tapped and enhanced by teachers and parents.

4. The Internet and Multimedia Technology

Easy and affordable connectivity to the Internet, the generally growing computer culture among younger generations and the advances in multimedia technology have created a sea of chunks of information in varying modes, depths and sizes. File Transfer Protocol (FTP) sites, gopher archives, Usenet-news and the WWW make it possible for an interested individual to access information stored in different forms in remote places within a matter of minutes, if not seconds. Netscape, Mosaic, Microsoft Internet Explorer, Web Crawler and other web browsers are continually evolving and competing with the text-based information access through Gopher, Archie and Veronica for example. Web browsers of today can present diverse web objects that can be called truly multimedia.

Multimedia technology has enhanced presentation of information in various complementary ways which make learning easier and more motivating. It is now possible, for example, by use of personal computers to mix text data, graphic objects, video images, sound clips etc., in one presentation. Personal computers are becoming cheaper and more powerful, thus increasing the use of multimedia and accessing information on the Internet. At college and university levels,

Multimedia has thus become a very important tool in classroom learning as it provides enhanced learning environments. Hypertext has made it possible to access information in layers and explore details only as necessary. File transfer protocols make it possible to copy chunks of information including graphics from one location to another. Sound effects and music are also possible through multimedia PCs and video-conferencing.

Generations of students in the 1990s are growing up with a computer culture. They spend their leisure time playing games on their parents' computers, video games in rented places especially in cities, and some communicate via electronic mail to their friends at a very young age. They are therefore very likely to learn new technological aspects without much strain, thus enjoying the learning process.

I remember as a Ph.D. candidate in 1995 at the Ontario Institute for Studies in Education (University of Toronto), sitting side by side in a computer room with an eleven year-old girl who was shuffling through home pages on the WWW without any constrain. I could not help asking what her age was. The girl had come with her mother who was at that time busy at another computer terminal struggling with her thesis data. It seemed obvious to me that the mother would not have as much time or even motivation to shuffle through the WWW like her daughter. Although this "aimless" shuffling through web pages was certainly not pre-planned for learning any prescribed portion of the school curriculum, it obviously constituted some sort of learning for the girl. This instance of a young child finding her way easily on the Internet is not typical; it is not

very rare either, especially in the North American context. It is likely that some students at different levels of schooling might have more time, opportunity and motivation to surf the Internet than their teachers, thus participating in the school curriculum with greatly enriched IT backgrounds differing from other students and from their teachers. The more exposed students might not get enough challenge from the school curriculum, especially their teacher's ways of teaching it. Information Technology makes teaching much easier if teachers are aware of it and can be selective of what their students need.

Getting Lost on the Internet

The Internet is the world's largest computer network, also referred to as the Information Superhighway. It is a global network of networks linking together other large and small computer networks in thousands. On accessing the Internet, unless the user knows what to look for, it is tempting to keep flowing with whatever information is accessed. Internet uses are many. Elmer-Dewitt (1994) listed the following:

(i) Email - sending and receiving mail electronically.

(ii) Talk - as in telephone but messages are typed.

(iii) Internet Relay chat - a group of users in a talk session.

(iv) File Transfer Protocol (FTP) - for fetching programs and documents from remote computers.

(v) Telnet - to operate a remote computer (long distance computing).

(vi) Archie, Veronica, Jughead, WAIS (Wide Area Information Service) - tools for searching the huge libraries of information stored on the Internet (traditionally text-oriented).

(vii) Gopher - for tunnelling quickly from one place to another on the Internet.

(viii) The WWW - a more advanced navigation system which organizes its contents by subject matter and capable of combining text data, graphics, video, or even sound clips.

(ix) CUSeeMe - for video conferencing.

Netscape, Mosaic, Microsoft Internet Explorer, Web Crawler, are currently among top-of-the-line Internet navigators, but which will probably be overtaken soon, given the fast changes. The decision to use one way or another to access information on the Internet is as important as the information being sought. While Internet browsers fulfil generally the same function accessing information through an inherently pre-determined manner, it is important to know and choose the best browser to access the information required. Using one search engine in Netscape for example, will yield different information from that obtained through another search engine on the same subject. The reason for this is, since a search engine relies on an index (or indices) maintained at a local site, and since no single organization or individual can come close to keeping track of the ever-growing diversity and dimension of the Internet, no search engine can claim any real coverage of the sea of information.

Getting lost on the Internet may entail:

(i) Being carried away by types of information one is not really intending to look for.

(ii) Not being able to access information on a desired subject.

(iii) Using a wrong tool to search for information on a certain subject and therefore not being able to access it.

(iv) Searching at (starting at) the wrong places on the Internet.

(v) Finding the document but being unable to use/handle it as desired, e.g. being unable to download it.

The abundance of information on almost everything, is in a way the greatest advantage or strength arising from IT. However, this very strength is, in a sense, the major weakness. The size and diversity translate into a growing difficulty in locating the desired information or document. Sometimes it is also difficult to know what information one really desires, or how it is organised on the Internet. Accessibility seems easy if one does not know or care what to look for. These are cases in which the user is just using the Internet for its own sake. In such instances students need help and guidance in order to make good use of the Internet in relation to learning the school curriculum. It is not a question of whether students can access information on the Internet; it is a question of what type of information they access, and how it enhances meaningful learning.

6. Abundant Information: Implications for the Curriculum Process

Is information power? Is every bit of information useful? Are there situations where students would rather *not know* than *know* certain things in order to learn better at school? What is learning? What is school learning? How does school learning differ from learning in everyday life? Why are there

differences between the two, (if any)? What do such differences mean, (if any)? There are no clear-cut answers to these questions. I will attempt to answer them from my own point of view based on my experiences as a school teacher and a professor of teacher education and also on my exposure to, and use of, IT in North America as a doctoral student and a research associate in several curriculum-related projects.

While it can be claimed that "information is power", I would argue that IT is a necessary ingredient for survival in modern societies. Every bit of information is useful in its own way. Some bits of information may be appealing at certain times and therefore be held dearly by the acquirer, while others may help the acquirer to shake off chunks of obsolete or unnecessary information, thus helping the individual to be more focused in the area of interest. The way in which information is accessed and how it can be manipulated to suit the needs for which it is sought, are important factors in learning. In other words, the information itself, the means for accessing it, the various ways in which it can be manipulated for effective use and the lessons learnt from this whole process, are worth a place in the school curriculum to help prepare students to function effectively in modern society.

Search for information has always been an integral part of school learning. The classroom teacher as the traditional primary source of information was always looked up to, for the provision of pre-sorted, well organized information directly related to the school curriculum. Often times the information is related directly to portions of the curriculum on which evaluation of performance in

the form of examination questions is likely to focus. As a classroom teacher I faced the challenge of choosing between teaching for the final examination on which the quality of the school would be judged, and teaching for students' learning to function in everyday life situations. I found it difficult to make a reasonable and acceptable choice between the two. It felt like making a choice between immediate survival (getting access to the next stage of schooling) and potential to be productive members of the Tanzanian society.

Careful screening and selection of information narrows down school learning to focusing on the prescribed curricula geared towards good grades. It therefore creates a gap between learning in school and learning to continually learn to interpret one's reality, re-interpreting knowledge and functioning in ways which suit that individual best and contribute positively to societal well being. My experience in teaching at university level has exposed me to a difference between school learning and learning to accommodate one's self in the world. School learning focuses on experiences of past generations of students, teachers, researchers, writers, curriculum planners; while learning to accommodate one's self in the world focuses on the "here and now" or current experience of the very learner, drawing only as necessary from experiences of past generations in order to explain current related situations. The learning that a graduate student acquires in order to be able to develop and write an acceptable independent study focuses more on the field of study than on applicability by the learner. A research report prepared for donor agencies justifying appropriate use of research funds may be geared towards the expectations of the donors, irrespective of the particular activities in the research process. My point is that there seems to be

serious inconsistency between what is learned for the purpose of maintaining the field of study for its own sake, and what is learned in order to function in one's every day life in society. Learners at all levels know this difference and they try to do both, because they need to be able to survive in the complexity of modern society as well as obtain their academic credentials. Until school learning is relevant to, and informs, learning to adjust in society, it will not be of immediate interest to students. Teachers will continue to struggle to motivate their students to learn in school. Students' free will to interact with IT on their own should be tapped and built upon.

7. Information Technology as a Necessary Common Platform

In North America, IT brings together teachers and students to a common platform with somewhat equal accessibility to information irrespective of the school curriculum. This platform exists regardless of the awareness of either party in the school learning process. It also underlies the process of school learning in ways that can be detrimental or constructive to the students' effort to learn to define themselves and function in the real world in their best possible ways. To facilitate constructive interaction between the teacher and the learner given this common platform, it is imperative for both parties to be aware of, and familiar with, the platform underlying their interactions.

Information Technology and its rate of change affects the curriculum process from the implementation and evaluation perspectives. The rocketing speed of increase of information and the

access through the Internet and multimedia equipment is forcing school learning to take place on a platform of information where students and teachers will interact as informed parties seeking to focus on particular issues of common interest as they arise. IT can never replace the teacher. As pointed out by Mushi (1996):

> Teaching is influenced by many factors, some of which are the classroom, the type of students it contains (some more knowledgeable and some less knowledgeable than the teacher), the location of the classroom and facilities within and outside the classroom. Among all these, the teacher is the single element in the classroom which can manipulate all other variables to fit the prevailing situation at a particular time, to make the students appreciate the need for learning (p.21).

This is a powerful position possessed by the teacher. To maintain this power and bring about effective learning teachers must still play a guiding role even with the common platform of information they share with students. Teachers need to familiarize with the information platform more cautiously than their students in order to be able to rescue students to meaningful learning by providing direction and structure for synthesis of relevant information. IT should then be seen as a potential link between school learning and life-long learning if teachers take advantage of the situation.

8. The Changed Role of the North American Teacher

In North America, the teacher's role has changed very fast with technological advancement; and as the younger generation of students join the band wagon. The fact that students are already accessing some sort of information out of their own interest has necessarily changed the role of the teacher. whether teachers are aware of this or not. Teachers are likely to find themselves in tricky situations where sticking to the old curriculum is unrealistic, and trying to control students accessibility to information is impractical and undesirable. Students access information from their homes, only sometimes under parents' supervision, in libraries, in renting places, etc. They search for information because they probably enjoy it - sometimes they may do it instead of doing their home work that is due the next day. This is not a breakage of the curriculum process; it is an enrichment which only needs acknowledgment and appropriate action by teachers and curriculum planners.
The subsequent paragraphs discuss the changing roles of the teacher:

From "Information Givers" to "Informed Guides"

Teachers have now to assume the role of guides for students, in their effort to learn meaningfully, given the information flow. To guide students, teachers first need to be informed themselves, about both IT and especially the Internet, students' interests and goals, and more importantly, how to use it more effectively. In countries like Tanzania, much more effort is required, to facilitate access to IT so that serving and pre-service teachers can get some exposure, at least to be aware of what is available because they will need to guide future generations in learning about, and utilizing, IT.

Local Curriculum Designers

Teachers, who have mostly been implementers of school curriculum will now assume the role of locally re-designing a generally outlined curricula for schools, to suit the needs of particular students. This is not the same as narrowing down a topic or teaching according to difficulty level as teachers have always done. It is a process of continually blending learning experiences with technological advancements, at the same time focusing on the important aspects of the school curriculum, and how it relates to IT.

Facilitator of Structures for Synthesizing Information

Acquisition of information is not enough in its own. Students need to use the information as a means for learning at personal, group and society levels. There is need for the teacher to develop and constantly adjust structures for understanding the information accessed by students, in ways that lead to coherent learning by the students. Clinical approaches to teaching will take a smaller and smaller portion of classroom time and focus. Classroom discussions will be of higher level because participants will be informed in the area of interest. Learning will therefore be at an advanced level.

Meta Evaluator

Teachers have always evaluated their students' learning outcomes. However, what needs to be evaluated is changing. Instead of trying to judge who remembers more of last week's lesson, it might be more useful to ask: how far have we gone and what haven't we updated in this area? In order for students to participate in such evaluative discussions, they have first to evaluate their own perceptions and understandings of previous learning experiences. If somebody has found an interesting piece of information closely related to the topic and wants to share it, then an "update" of information can take place. The teacher's role as an evaluator of classroom learning thus involves overseeing students' discussions/exchange of ideas, the synthesis, and also their evaluation of their own learning. The teacher therefore becomes a meta-evaluator.

Two-way Curriculum Moderators

Core curriculum documents used by teachers are prepared by curriculum planners who need feedback from schools in order to revise them from time to time. The feedback will no longer be teachers' personal comments on the process of implementing the curriculum but a synthesis of classroom proceedings which include students' reactions and input. Feedback will rather be teachers' suggestions for modifications based on the actual classroom processes as they are affected by students' relationships to technological advancement, their exposure, and how the teacher dealt with these, together with the resulting expertise acquired by the teacher and students in this process. The teacher will therefore continually moderate the curriculum both ways, i.e., for students to learn effectively and for curriculum planners to incorporate changes and allow for flexibility as may be

necessary. The teacher becomes an important curriculum moderator, not just a mere implementer.

9. Implications for *Practical Classroom Situations: Qualities of the Teacher*

The above roles call for several important teacher qualities:

(i) Ability and willingness to detach themselves from the mainly one-way top-down mode of curriculum design, implementation and evaluation.

(ii) Motivation and time to keep abreast with the ever-increasing IT and the various ways of accessing information.

(iii) Ability to develop skills to screen, select, and control relevant use of sources of information to gear such use towards higher level learning (not accessing information for its own sake).

(iv) Awareness of, interest in, and ability to tap, students' emerging concerns/innovations which feed back into their own curriculum planning.

(v) Ability to develop an art and a science of managing multilevel, multifaceted processes of learning among young individuals considered to be a coherent group and therefore a class at a particular time.

(vi) Ability to oversee and provide direction to student interaction online and collectively in class.

(vii) Acquisition of appropriate ways to jointly develop themes (with students) which tap the various aspects of concern within the class.

(viii) Ability to communicate ideas and concerns online via computer conferencing, teachers'

forums, journals, formal and informal chatting. This process may lead to consensus on major issues and goals of the wider curriculum at school board, school district, state or national level.

10. Concluding Remarks

This paper is not a prescription of what teachers should do given the new technological trends in Canada and the United States. Rather, it is a reflection into the current transition period (which has never been faster) from the traditional teacher-centred teaching to the inevitable even more student-centred learning, a process in which teachers may have much to learn in order to eventually teach in meaningful ways. The earlier teachers jump onto the band wagon the better. It is difficult to predict what the next decade has in store for IT and school learning; however, it is not impossible to foresee a greater challenge to both teachers and students.

The role of the teacher in North America and probably other developed countries has changes significantly. Teachers should have the motive to acquire IT literacy and use as an inevitable part of the curriculum process, from its planning to its evaluation. This teacher quality should be fostered in teacher preparation programs.

For teachers in developing countries, the need to keep abreast with IT may look less pressing at the

present time, but the catching up process will be even harder. Since IT is slowly filtering through to these countries, teacher preparation programs should create an opening to tap and use it whenever resources allow. Direst collaborations between teacher preparation programs in North America and East African countries for example, would be a promising way to ensure that IT crosses socio-economic barriers. Such collaboration would break cultural boundaries and ease learning in our global village. In this IT age acquisition of information is important, but its timeliness is even more important.

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